CLAIMS

1. A device (1,100) for injecting a pulsed supersonic gas flux, characterized it includes a first chamber (2) inside which the gas to be injected is found under pressure on either side of a free piston (4), the device (1,100) comprising means (12) for setting this free piston into motion, connected to said first chamber (2) and capable of causing propulsion of the free piston (4), said device (1,100) further including a supersonic nozzle (6) for ejecting the gas, capable of communicating with the first chamber (2) via an aperture (8) provided in this first chamber (2), and also including a valve (10) closing up said aperture (8) and able to be actuated by percussion of the free piston (4).

2. The injection device (100) according to claim 1, wherein the means (12) for setting the free piston into motion are able to create a pressure difference in the gas to be injected on either side of the free piston (4).

3. The injection device (100) according to claim 1, wherein the means (12) for setting the free piston into motion comprise a second chamber (14) inside which the gas to be injected is found under pressure on either side of a controlled piston (16).

4. The injection device (100) according to claim 3, wherein said second chamber (14) is connected to said first chamber (2) via a first connection conduit (18) having a first end portion (2a) of the first chamber (2) communicate with a second end portion (14b) of the second chamber (14), and via a second connection conduit (20) having a first end portion (14a) of the second chamber (14) communicate with a second end portion (2b) of the first chamber (2), so that a movement of the controlled piston (16) in the direction from the second (14b) to the first end portion (14a) of the second chamber (14) causes the free piston (4) to be propelled in the direction from the second (2b) to the first end portion (2a) of the first chamber (2), and vice versa.

5. The injection device (100) according to claim 4, wherein the second end portions (2b,14b) of the first and second chambers (2,14) correspond to a low end portion of the first and second chambers (2,14) of the device (100), respectively.

6. The injection device (100) according to claim 4, wherein the first end portion (14a) of the second chamber (14) of the device (100) includes a gas inlet (22) intended to be connected to a supply of gas to be injected.

7. The injection device (100) according to claim 3, wherein the controlled piston (16) is able to be actuated by a magnetic assembly (26), including two spaced out coils (28,30) and mounted so as to encircle said second chamber (14) of the device (100).

8. The injection device (100) according to claim 4, wherein the second chamber (14) is provided with an adjustable by-pass (24) allowing the flow of the gas to be injected between the first and second end portions (14a,14b) of this second chamber (14).

9. The injection device (100) according to claim 4, wherein at least one of the components taken from the free piston (4) and the controlled piston (16) is housed in its associated chamber (2,14), in order to form a narrow passage for the gas, between both compartments of the chamber which it defines.

10. The injection device (100) according to claim 4, wherein said first chamber (2) is closed up at its second end portion (2b) by means of a closing block (40) comprising a first (42) and a second port(44), said first port (42) cooperating with the first connection conduit (18) and opening up into a channel (34) adjacent to the first chamber (2) communicating with the first end portion (2a) of this first chamber (2), said

second port (44) cooperating with the second connection conduit (20) and directly opening up into the first chamber (2) of the device (100).

11. The injection device (100) according to claim 4, wherein the valve (10) closing up the aperture (8) provided in the first chamber (2) of the device (100) has a head (48) passing through this aperture (8) and protruding in an injection enclosure (46) provided in the first end portion (2a), said injection enclosure (46) being able to be closed by the free piston (4).

12. The injection device (100) according to claim 11, wherein the free piston (4) includes an external component (60) as well as an internal component (64) sliding in the external component (60), the internal component (64) being intended to strike the head (48) of said valve (10) in order to actuate it, and the external component (60) being intended for closing said injection enclosure (46).

13. The injection device (100) according to claim 1, wherein said valve (10) is tensioned via a spring (50), so as to crush a gasket seal (52) located around said aperture (8) provided in the first chamber (2) of the device (100).

14. The injection device (100) according to claim 13, wherein the spring (50) is located in a housing (54) made as one single part with the first chamber (2), said housing (54) and the first chamber (2) being substantially cylindrical and coaxial and separated by said aperture (8) provided in the first chamber (2) of the device (100).

15. The injection device (100) according to claim 14, wherein the housing (54) of the spring (50) has a port (58), having an interior space of this housing (54) communicate with said supersonic nozzle (6) of the device (100).

16. The injection device (1,100) according to claim 2, wherein the gas to be injected is introduced into the device (100) at a pressure between about 3 and 10 bars.

17. The injection device (1,100) according to claim 1, wherein the means (12) for setting the free piston into motion are able to cause opening of the valve for a period of about 2 ms, and ejection of gas from the supersonic nozzle (6) in an amount of the order of 0.5 $Pa.m^3$ for a period of about 0.5 ms, at an operating frequency of at least 10 Hz.